

# Project 1: Test a Perceptual Phenomenon

By Wenny Wu

## 1. EXPERIMENTAL VARIABLES

independent variable: **congruent versus incongruent stimuli; congruent stimuli are given when the ink color of the word and the word itself refer to the same color and incongruent stimuli are given when the ink color of the word and the word itself refer to different colors**

dependent variable: **reader's reaction time to naming the color of the words**

## 2. HYPOTHESES AND STATISTICAL TEST

- a. null hypothesis,  $H_0: \mu_{\text{incongruent}} - \mu_{\text{congruent}} = 0$

*where  $\mu_{\text{congruent}}$  is the mean of the congruent test and  $\mu_{\text{incongruent}}$  is the mean of the incongruent test*

The mean response time of the congruent test does not differ from that of the incongruent test.

alternative hypothesis,  $H_A: \mu_{\text{incongruent}} - \mu_{\text{congruent}} > 0$

The mean response time of the incongruent test is greater than (slower) the mean response time of the congruent test.

- b. statistical test: **paired t-test**

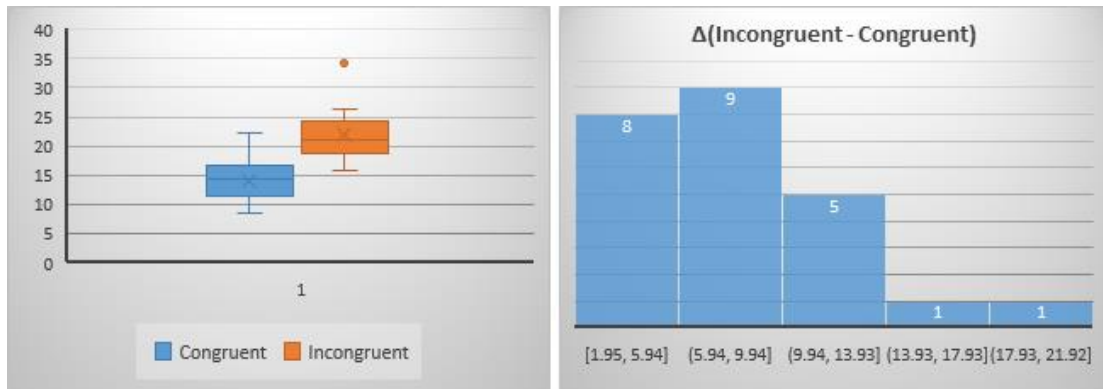
The sample size is fairly small ( $n = 24$ ), and only the sample standard deviations are known in place of the population standard deviation, so a t-test must be used.

A paired (dependent) t-test is used because the observations are not independent of one another – each participant recorded a score for both the congruent test and the incongruent test.

## 3. DESCRIPTIVE STATISTICS

	Congruent	Incongruent	$\Delta$ (Incongruent - Congruent)
Mean	14.05	22.02	7.96
Median (robust against outliers)	14.36	21.02	7.67
Standard Deviation	3.56	4.80	4.86

#### 4. VISUALIZATIONS



The response times for the incongruent test appear to be greater than those for congruent test; the majority of test takers took 1.95-9.94 seconds longer during the incongruent test versus the congruent test. Two outliers exist for the incongruent test.

#### 5. INFERENTIAL STATISTICS

degrees of freedom = **23**

confidence level,  $\alpha = 0.05$

critical t-value,  $t^* = 1.714$

t-statistic,  $t(23) = 8.02$ ,  $p < 0.05$ , one-tailed

p-value,  $p = 5.00 \times 10^{-5}$

Cohen's  $d = 1.64$

$r^2 = 0.74$

confidence interval on mean difference; **95% CI = (5.91, 10.02)**

The test result is statistically significant, so we reject the null hypothesis.

As expected, the test results show that people have a slower response time to reading incongruent data, where the color of the word is different than the word itself.

#### RESOURCES

t-table from Udacity's link

GraphPad

Stroop Effect Wikipedia page: [https://en.wikipedia.org/wiki/Stroop\\_effect](https://en.wikipedia.org/wiki/Stroop_effect)

[http://www.ats.ucla.edu/stat/spss/output/Spss\\_ttest.htm](http://www.ats.ucla.edu/stat/spss/output/Spss_ttest.htm)